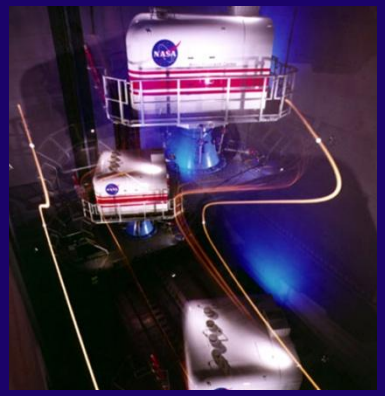
Simulation Laboratories

NASA Ames Research Center

July 27, 2011

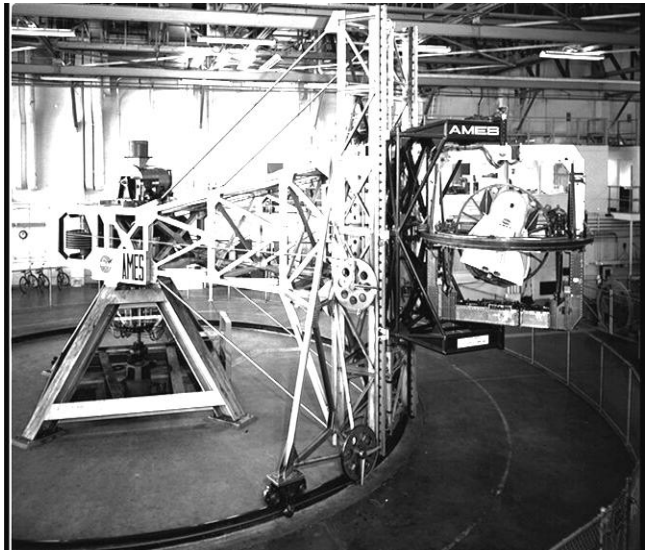


Dean Giovannetti / Deputy Chief
Aerospace Simulation Research and Operations Branch (AFS)

Ames Research Center

Simulation Heritage at Ames

Modified
Centrifuge
5 DOF



(c. 1960)

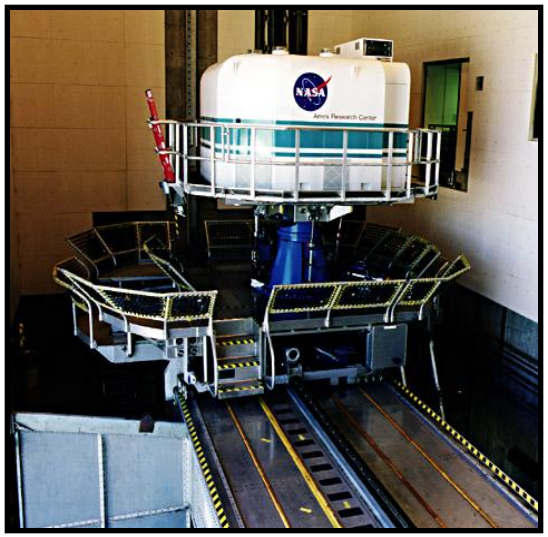
6 DOF
Flight Simulator

(c. 1964)

Flight Simulator
For Advanced Aircraft
(FSAA)

(c. 1969)

Current Simulation Facilities



Vertical Motion Simulator (VMS)

•World's largest motion system
- 60 ft. vert. travel, 40 ft. lat. travel
• Interchangeable cabs - configurable cockpit designs
• Rapid prototyping of S/W & H/W systems designs

Crew Vehicle Systems Research Facility (CVSRF)

• Full-mission, high fidelity simulation
• B747-400 flight simulator
• Advanced Concepts flight simulator
• Air Traffic Control simulator

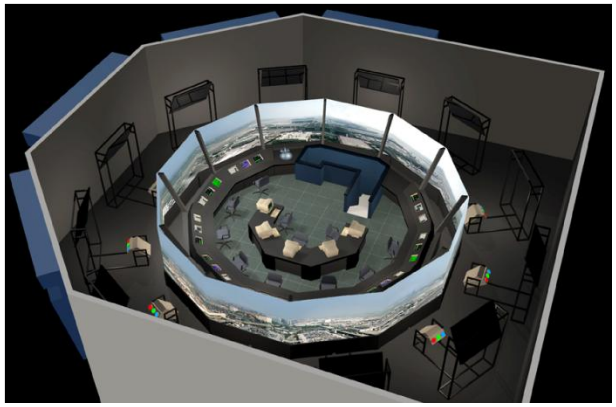
Future Flight Central (FFC)

• Full-scale, high fidelity airport tower simulator
• 360 degrees out-the-tower view
• 3D photo-realistic high resolution model of the airport

FutureFlight Central

Facility:

- Full-scale, High Fidelity Airport Tower Simulator
- 360 degrees out-the-tower view
- 3D photo-realistic high resolution model of the airport

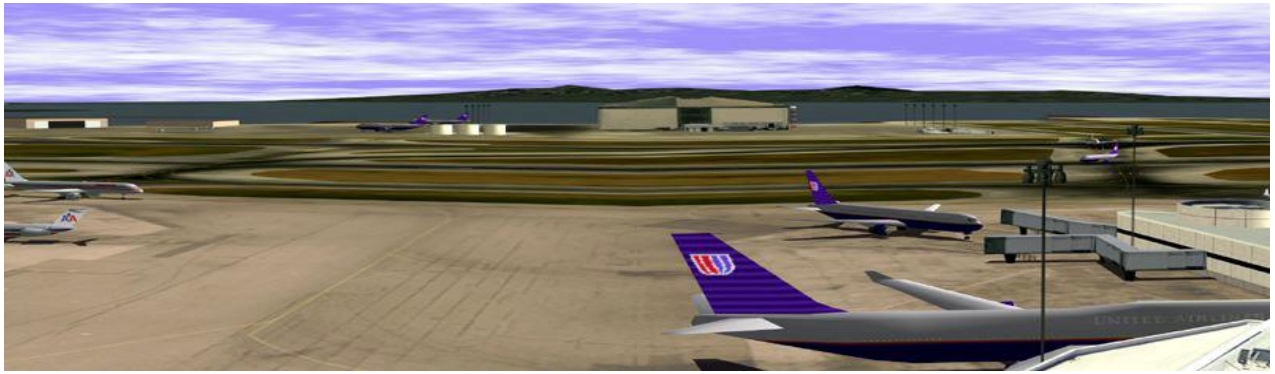


Mission:

Provide a simulation environment to test the capacity and safety of expansion plans, procedure changes and new technologies for airports

Supports Important National Research Programs

- **Advanced Air Transportation Technology Program**
- **FAA National Programs**
- **Industry/Airport Improvements**



Crew Vehicle Systems Research Facility

Facility

- Full-mission, High Fidelity Simulation Facility
- B747-400 Flight Simulator
- Advanced Concepts Flight Simulator
- Air Traffic Control Simulator

Mission

Support Aeronautical Human Factors Research Aimed at Improving Airspace Operations Safety and Efficiency

- Fully Integrated Aircraft and ATC Simulation
- Airline Flight Crews Employed in Studies
- Extensive Data Collection Capability

Support Important National Research Programs

- Terminal Area Productivity
- FAA National Programs
- Advanced Air Transportation Technology Program

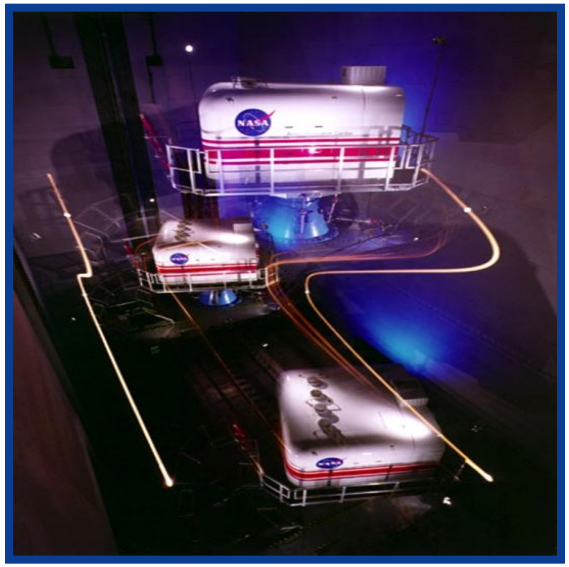
Vertical Motion Simulator

Facility

- World's largest motion system
  - -60 ft. vertical travel, 40 ft. lateral travel
  - -Six *independent* degrees-of-freedom
- Interchangeable cabs - configurable cockpit designs
- Rapid prototyping of S/W & H/W systems designs

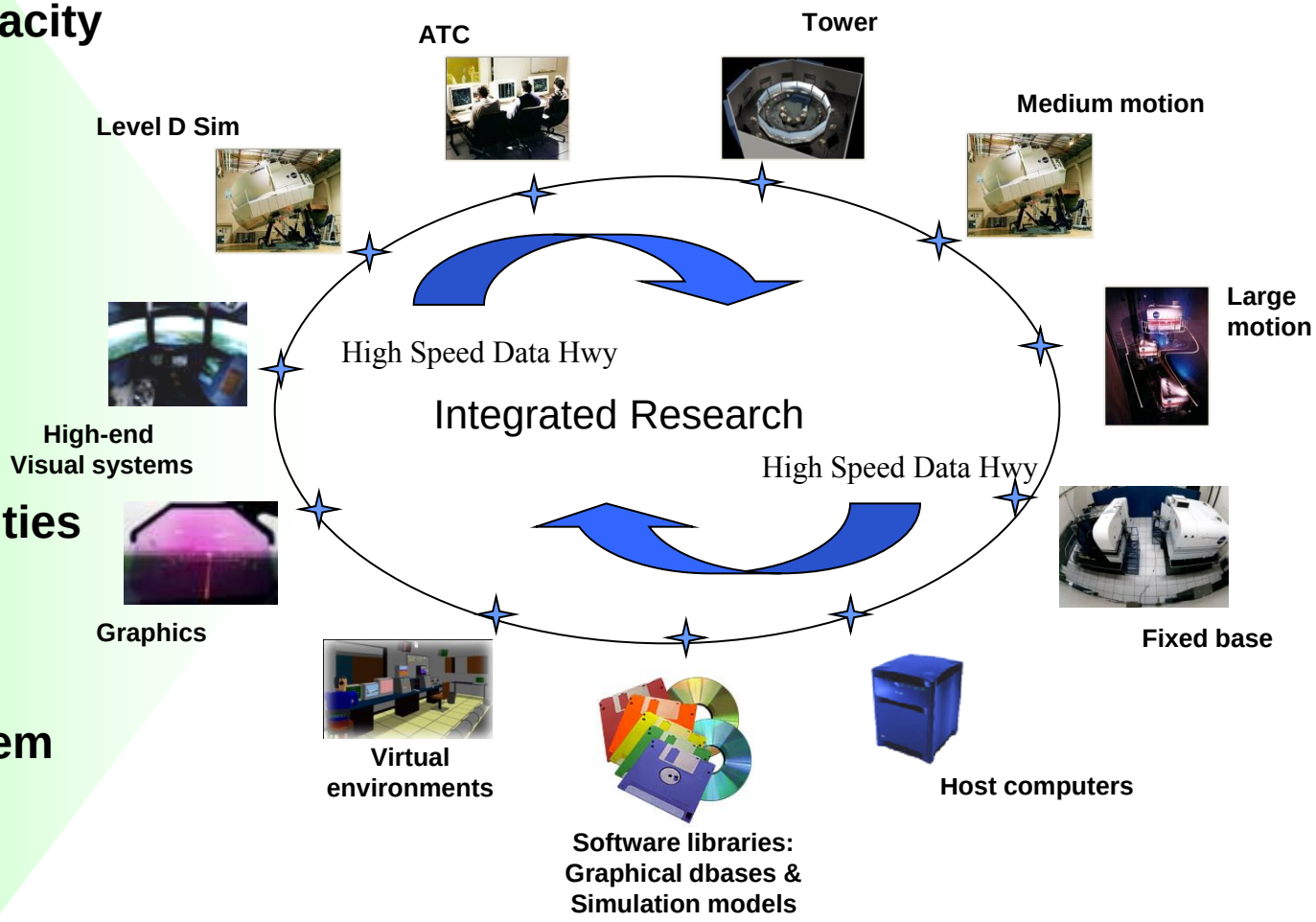
- No other simulator with comparable range of motion and fidelity of cueing

- Used for broad range of vehicles:
  - Shuttle, Joint Strike Fighter, C-17, Comanche, XV-15, Civil Tilt Rotor, AV-8B, UH-60, AH-64, High Speed Civil Transport, CH-47, National Advanced Driving Simulator



SIMULATION LABORATORY ENVIRONMENT

- Transportation Capacity Improvements
- Aerospace Safety Improvements
- Design Life Cycle Research
- Human/Machine Interface Research
- RLV Handling Qualities Research and Down-Select
- Robust Intelligent Flight Control System Research
- Collaborative Research Tools



Simulation Laboratories

- **Capabilities**
  - **Control systems, math model development, flight control motion base tuning, visual systems design & integration, mechanisms, instrumentation, safety & reliability, displays & controls and avionics, etc.**
  - **Operate, maintain and upgrade all aspects of the simulators and facilities.**
  - **Responsible for keeping facilities at the forefront of simulation.**

Diversity of Simulations at SimLabs

VMS:

- Joint Strike Fighter
- Advanced Theater Transport
- Comanche Helmet Mounted Display
- CH-47 Digital Automatic Flight Control System
- C-17 Flight Controls and Handling Qualities
- Civil Tilt Rotor
- Simulation Fidelity Requirements
- NTSB Accident Investigation
- Space Shuttle Vehicle Landing and Rollout Training

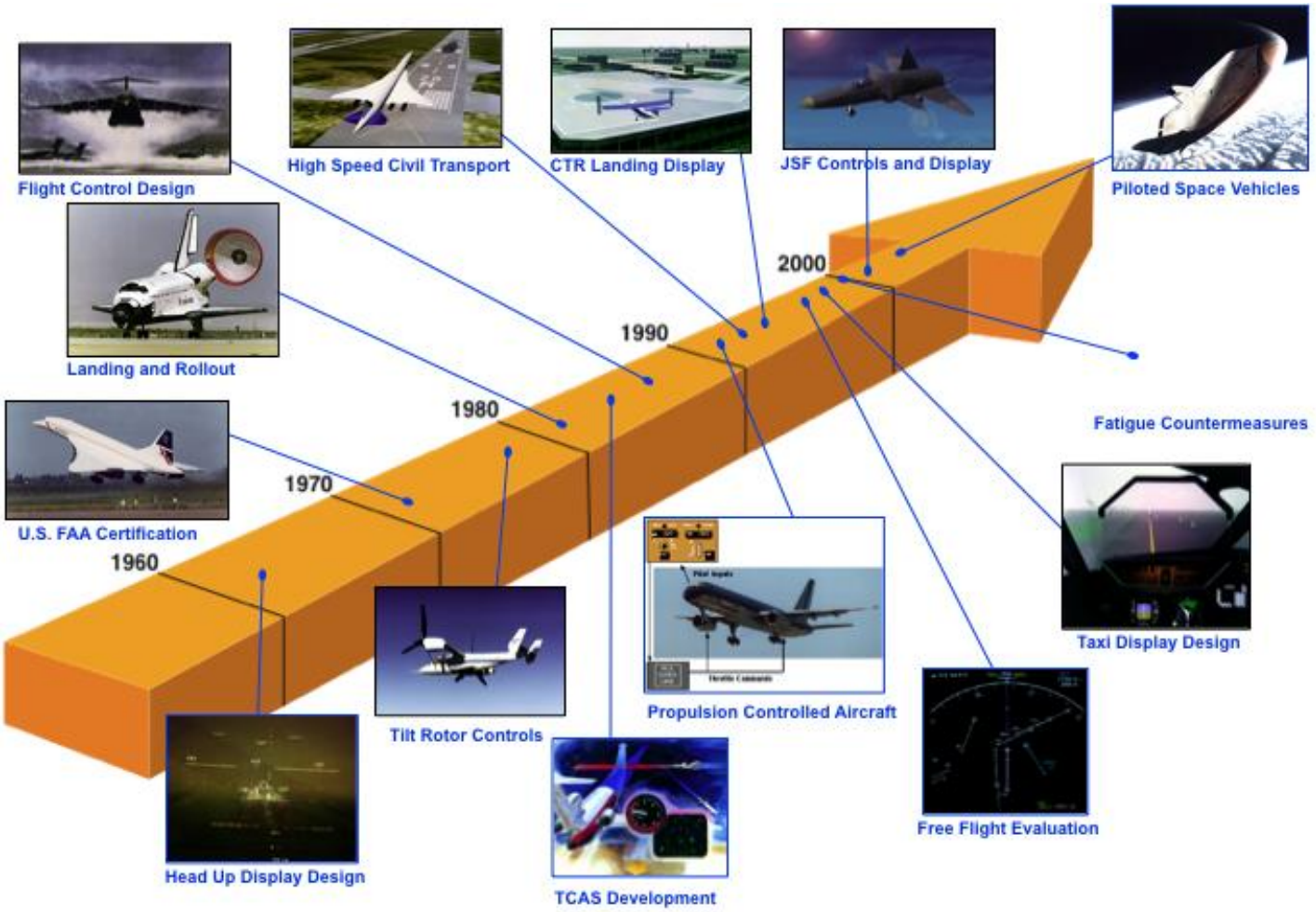
CVSRF:

- Very Closely Spaced Parallel Approach Studies
- Trajectory Based Negotiations
- Terminal Area Capacity Enhancement Concept
- Virtual Airspace Simulation Technology (Real-time Distributed Simulation)

FFC:

- Chicago O'Hare Modernization
- Ivanpah Valley Airport Airfield Alternatives Analysis
- DFW End-around Taxi System
- LAX North Airfield Safety Simulation

Ames Simulation Contribution



Simulation Laboratories

The SimLabs II procurement requires operation, development, maintenance, and modification of the Simulation Laboratory Facilities.

The SimLabs II procurement will require the following contractor support:

- Simulation Experiments: planning, preparation, operations, Research and Development and post Research and development support
- Discrete Projects: facility refurbishment or upgrade, or other facility tasks
- Maintenance: primarily on-demand to maintain facility availability for mission/customer support
- Functional Capabilities: systems engineering and graphics programming support
- Additional functions: support government's outreach and business development efforts to potential customers

Place of Performance: Ames Research Center, Moffett Field, California